3-2009

Shark Teeth Classification

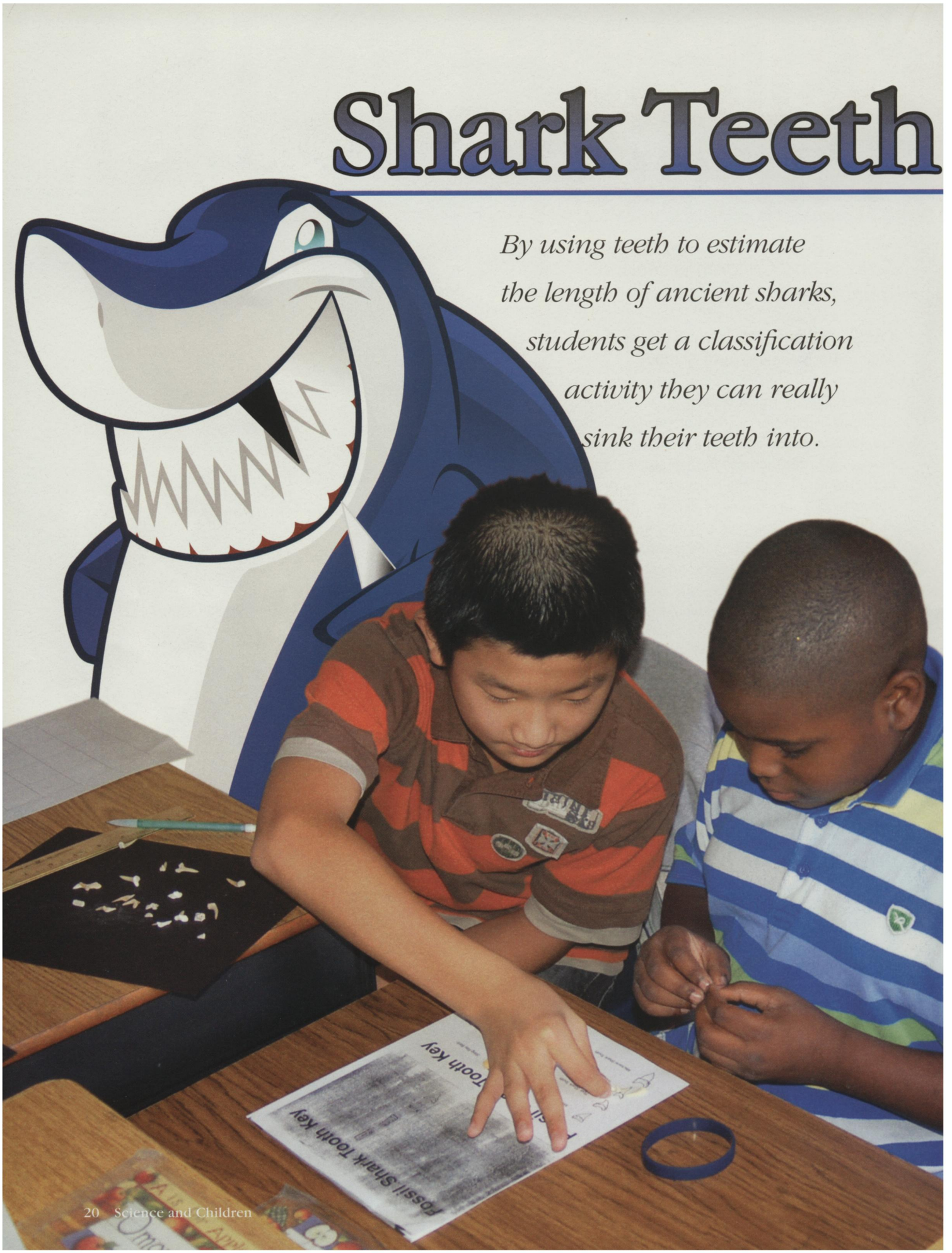
Tom Brown
Kennesaw State University, tbrown@kennesaw.edu

Sally Creel
Cobb County School District

Velda Lee
Harmony Leland Elementary School, Mableton GA

Shark Teeth

By using teeth to estimate the length of ancient sharks, students get a classification activity they can really sink their teeth into.



Classification

By Tom Brown, Sally Creel, and Velda Lee

On a recent autumn afternoon at Harmony Leland Elementary in Mableton, Georgia, students in Velda Lee's fifth-grade science class investigated the essential process of classification—the act of putting things into groups according to some common characteristics or attributes. While they may have honed these skills earlier in the week by grouping their own shoes or school supplies, this class provided the unique opportunity to classify objects that are inherently fascinating to students—shark teeth fossils! After all, what could possibly engage students more than working with the primary weapons of some of the most excellent hunters on the planet?

While Ms. Lee has accumulated a respectable repertoire of effective science activities, today's lesson originated from her participation in the Northwest Georgia Science Education Partnership (GSEP)—a project designed to provide teachers with intensive learning experiences that build content knowledge and improve teacher confidence in implementing inquiry-based science. The project promotes an "Explore, Then Explain" approach to science where students are engaged in active investigation of key ideas and concepts before detailed explanations are provided and discussed.

Classification Basics

Before starting the day's exploration, Ms. Lee highlighted a few reasons why sharks are truly amazing creatures worthy of our admiration. After stressing their excellent sense of smell, she described how sharks can detect the vibrations of other animals in the water, which aids them in hunting. When she mentioned that sharks have successfully adapted to their changing environment for millions of years, she asked her students if they could remember what the word *adaptation* meant from their studies in fourth grade. Antoine suggested that it was something that helps them adjust to an area. Natalie offered an example of a rabbit whose fur changes to white in order to blend in during the snowy winter.

Next, Ms. Lee probed prior knowledge and informally assessed her students' understanding of classification. Based on their responses to her preliminary questions, she adjusted her instruction. For example, Ms. Lee asked the students, "What do we mean by classify?" Quincy replied, "Describe and study," and then Carlos added, "Sort, like we did in kindergarten." Ms. Lee used these responses as an opportunity to encourage her students to make connections between prior experiences and the current topic of study. "What are some characteristics we might use to classify objects? Think back to kindergarten. What did you use?" The students responded by generating a list of attributes or characteristics (shape, size, color, texture, etc…) used to classify objects. After soliciting some additional responses, Ms. Lee quickly emphasized that we normally group or classify objects according to characteristics that we think are important. She then redirected their attention to the primary task of the day—the observing, measuring, sketching, and sorting of the spectacular teeth.

Shark Tooth Sort

Next, after the introductory discussion, pairs of students were provided with samples of 20–25 shark teeth and a couple of magnifying glasses. The teeth were provided through the GSEP project, but bags of assorted teeth are readily available from a variety of vendors and surprisingly cheap, too (see Internet Resources). Students were given several minutes to closely observe each of the fossils using as many of their senses as possible (with the notable exception of taste). Ms. Lee encouraged her students to handle the teeth with care as some of them were sharp to the touch.

Students were encouraged to use their detailed observations to help place their shark teeth into groups according to some important attribute of the teeth. One group noted that a few of the teeth had "tiny baby teeth on the sides." Another group focused primarily on the differences in length between the teeth. To help guide

Figure 1.

Shark teeth classification worksheet.

In the first part of this exploration, your job is to closely observe your collection of shark teeth fossils. Each member of your group should carefully look at each tooth and note how they are similar and different from each other. After observing each tooth, your next task is to separate them into groups based on some attribute (characteristic) that you think is important. This process of separating things into groups according to some common characteristic is called *classification*. Along with shark teeth, your example may contain fragments of manta ray crusher plate, sting ray barbs, and even a shark vertebrate. While these are definitely worth observing, we are going to focus on teeth in this activity.

After separating the teeth into groups (usually 3–5), your job is to

- Name each of your groups,
- Sketch a representative (typical) example of a tooth from each group,
- Measure the length of the tooth in inches,
- Calculate the approximate size of the largest shark (in feet) from each group (by multiplying the measurement by 10),
- Draw a table or graph to illustrate your results, and
- Be prepared to discuss how you classified your teeth into different groups.

Name of Shark Group	Sketch of Tooth	Length of Tooth (inches)	Estimated Length of Shark (feet)
Rippers		1.2 inches	12.0 feet
Grinders		.91 inches	9.1 feet
Pokers		1.5 inches	15.0 feet

their efforts, Ms. Lee emphasized that the shapes and sizes of the teeth vary depending on what kind of prey the sharks are adapted to hunt. Some shark species have wide, wedge-shaped teeth designed for tearing apart prey, while other species have thin, sharp teeth that are designed to catch and hold on to slippery fish. While a few groups sorted the teeth according to relative width and length, most sorted them according to their suspected method of hunting.

Once the shark teeth were placed into groups, students were asked to name each group, sketch a representative sample from the group, and measure the length of that same tooth. As one group sorted and sketched their teeth, they decided to place them into three different groups: the Rippers, the Grinders, and the Pokers. Students measured and recorded their data on a worksheet (Figure 1). As students measured, some questioned whether they should include the end portion that looked like the root. Ms. Lee encouraged the students to decide for themselves while reminding them that scientists must be consistent from measurement to measurement.

As they compared their data with each other, they shared many interesting ideas. One boy wondered if all the teeth in the same shark would be the same size. After acknowledging his thoughtfulness, Ms. Lee explained that, while the teeth in a shark would vary a little in size, larger teeth would usually belong to a larger shark.

The students were energized to find out that the size of each tooth could also be used as a rough estimate of the overall length of these ancient beasts. By taking the length of one side of their tooth in inches and multiplying by 10, the students were able to obtain a reasonable approximation of the shark's size in feet.

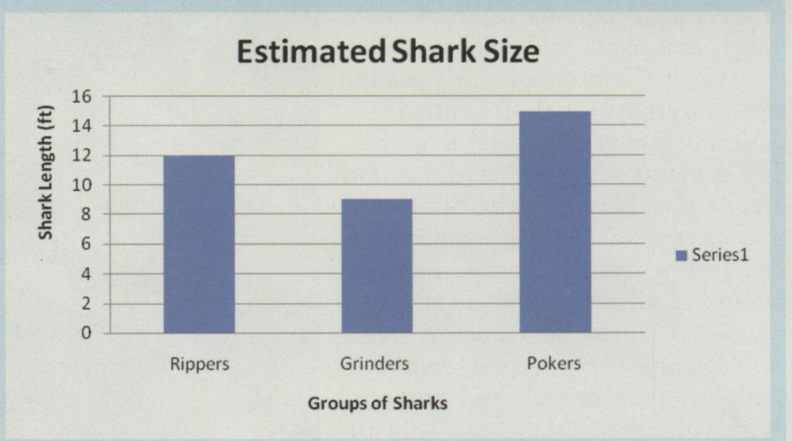
Graphing by Size

As students worked, Ms. Lee circulated around the room answering questions, providing guidance, and offering suggestions. As she moved from group to group, she asked students whether they thought it would be better to record their measurements as a mixed number or a decimal. After recognizing how a decimal would help to simplify the conversion from inches to feet, many students decided to modify their measurements.

Through these conversations, Ms. Lee was able to get a feel for the depth to which each group understood the process of classification and the mathematics involved in the conversions. When she encountered a group that seemed to be struggling, she provided an immediate intervention focused on their specific needs. For example, after noticing that one group was measuring the shark teeth improperly, Ms. Lee provided the students in the group with a mini-lesson on proper measurement techniques. She then asked students to apply what she had taught and observed them as they correctly measured a tooth and recorded the data on the chart.

As students began to complete their calculations and finish recording their data, it was time to generate a graph to represent their findings. But rather than graphing their data in their notebooks or science journals, the teacher had students use their computers and the program Excel to assist them in this process.

Figure 2.



PHOTOGRAPHS COURTESY OF THE AUTHORS

Students measured their shark teeth, sorted them into similar groups, and carefully recorded their observations.

Many of the students in the class had basic experience with word processing programs but not with Excel. However, students were able to navigate the program fairly easily, and each group was able to enter their data and generate a useful graph. The students who generated the first graphs also became peer tutors for the other students. An example of one group's graph comparing the groups of sharks and their size estimates is shown in Figure 2, page 23. In using computers to improve students' presentation and analysis of real data, Ms. Lee was able to integrate technology into students' daily activities.

PHOTOGRAPHS COURTESY OF THE AUTHORS

The classification activity gave students the opportunity to ponder how tooth shape affects prey.

Making Connections

Following a brief oral summary where Ms. Lee highlighted that the main purpose of classification is to organize things according to a purpose, students summarized their learning in science journals. The lesson's essential question, How does the process of classification help scientists?, served as the journal prompt. Ms. Lee uses journals in each subject area throughout the year. Students are encouraged to provide detailed examples and personal connections to the topic as they reflect on their learning. Ms. Lee used their journal entries, the student-generated data tables, and Excel graphs as summative assessments of the learning. Most journal entries demonstrated that students understood the basic purpose of classification, such as one girl who wrote, "We were grouping the shark teeth according to the shapes of the teeth." Many students also wrote about their use of mathematics and technology in the lesson. For instance, one child explained, "I used the computers for technology because I had to graph it. I learned that you can use math in science to figure out the answers." When all was said and done, one thing was crystal clear—shark teeth classification was one cool exploration. ■

Tom Brown (tbrown@kennesaw.edu) *is an associate professor of science education at Kennesaw State University in Kennesaw, Georgia. Sally Creel* (Sally.Creel@cobbk12.org) *is the K–5 Science Supervisor for Cobb County Schools in Marietta, Georgia. Velda Lee* (Velda.Lee@cobbk12.org) *is a fifth-grade teacher at Harmony Leland Elementary School in Mableton, Georgia.*

References

Bravo, M., and E. Garcia. 2004. *Learning to write like scientists: English language learners' science inquiry and writing understandings in responsive learning contexts.* Paper presented at AERA Annual Meeting, San Diego, CA.

Maatta, D., F. Dobb, and K. Ostlund. 2006. Strategies for teaching science to English learners. In *Science for English Language Learners,* eds. K. Fathman and D. Crowther. Arlington, VA.: NSTA Press.

Internet Resources

Educational Innovations
www.teachersource.com

Enchanted Learning
www.enchantedlearning.com

The Life and Times of Long Dead Sharks
www.elasmo.com/index.html

Connecting to the Standards

This article relates to the following *National Science Education Standards* (NRC 1996):

Content Standards
Grades 5–8

Standard A: Science as Inquiry
- Abilities necessary to do scientific inquiry

Standard C: Life Science
- Structure and function

National Research Council (NRC). 1996. *National science education standards.* Washington, DC: National Academy Press.